

# Washington State University Energy Program Energy Audit Workbook

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Energy Audit Instructions

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*Please Print or Type*  
**1. Building Information**

Name of Institution		Address					
Owner, if other than Institution		Address					
Name of Building		Building #					
Address (Street or P.O. Box)		City, State, Zip					
Date of Audit	Type of Institution Public ___ Private Non-Profit ___ Other ___						
Building Manager (administrator responsible for bldg.)			Bldg. Mgr.'s Phone				
Energy Management Coordinator (EMC) or Monitor			EMC's Phone				
Person Completing this Audit (include Cert. #)			Phone				
<u>Building Type and Category</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 25%; vertical-align: top;"> <u>School</u>            ___ Element.            ___ Second.            ___ Comm.Coll.            ___ Coll./Univ.            ___ Voc. Tech.            Ctr.            ___ Other, Specify _____         </td> <td style="width: 25%; vertical-align: top;"> <u>Hospital</u>            ___ General            ___ Psychiatric            ___ Other, Specify _____         </td> <td style="width: 25%; vertical-align: top;"> <u>Government</u>            ___ Federal            ___ State            ___ City/County            ___ Special Dist.            ___ Indian Tribe         </td> <td style="width: 25%; vertical-align: top;"> <u>Public Care</u>            ___ Nurs. Home            ___ Long-term care            ___ Rehab. Center            ___ Orphanage            ___ Public Health            ___ Res. Child Care            ___ Other, Specify _____         </td> </tr> </table>			<u>School</u> ___ Element. ___ Second. ___ Comm.Coll. ___ Coll./Univ. ___ Voc. Tech. Ctr. ___ Other, Specify _____	<u>Hospital</u> ___ General ___ Psychiatric ___ Other, Specify _____	<u>Government</u> ___ Federal ___ State ___ City/County ___ Special Dist. ___ Indian Tribe	<u>Public Care</u> ___ Nurs. Home ___ Long-term care ___ Rehab. Center ___ Orphanage ___ Public Health ___ Res. Child Care ___ Other, Specify _____	<u>Building Use</u> ___ Office ___ Storage ___ Library ___ Services ___ Police Station ___ Fire Station ___ Dormitory ___ Prisoner Detention ___ Other, Specify _____
<u>School</u> ___ Element. ___ Second. ___ Comm.Coll. ___ Coll./Univ. ___ Voc. Tech. Ctr. ___ Other, Specify _____	<u>Hospital</u> ___ General ___ Psychiatric ___ Other, Specify _____	<u>Government</u> ___ Federal ___ State ___ City/County ___ Special Dist. ___ Indian Tribe	<u>Public Care</u> ___ Nurs. Home ___ Long-term care ___ Rehab. Center ___ Orphanage ___ Public Health ___ Res. Child Care ___ Other, Specify _____				
Date of construction, if known _____							
Original Architects (if known)		Original Engineers (if known)					
Building Modifications or Changes In Use Anticipated in the next 15 yrs:			Remaining Useful life of the building: _____ Years				
Does the Institution Have an ongoing energy management program?			___ Yes ___ No				
Previous Energy Audits Completed? (if yes, give dates) ___ Yes ___ No Dates _____							
Previous Architectural/Engineering Studies Undertaken? (if Yes, Specify) ___ Yes ___ No							
Name of Electric Utility		Is this building on the National Historic Preservation Register? ___ Yes ___ No					

## 1. Building Information

Energy Saving Operation and Maintenance Procedures Implemented or Under Consideration Prior to this Audit (specify which). Please include an estimate of implementation cost and energy savings in kWh/yr and Btu/yr.

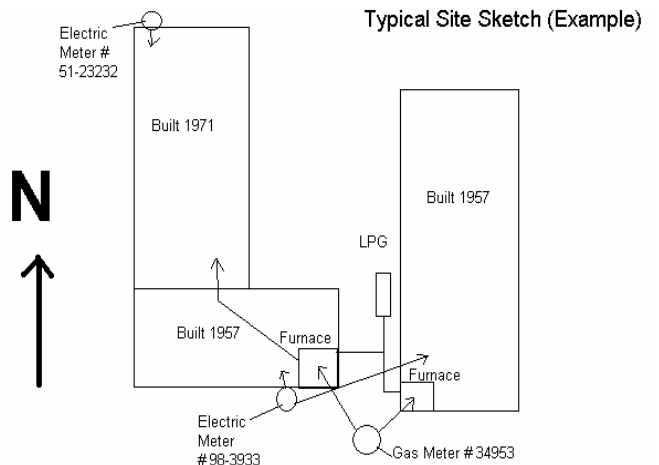
Conservation Measures (retrofit) Already Implemented or Under Consideration Prior to this Audit (specify which). Please Include Estimate of Cost and Savings if Available.



## BUILDING INFORMATION

On the following page, prepare a site sketch of your building or building complex which shows the following information:

1. Relative location and outline of the building(s).
2. Building Age
3. Building Number (Assign numbers if buildings are not already numbered.)
4. Building Size
5. Fuel Type
6. Location of heating and cooling units
7. Heating plants
8. Central cooling system, etc.
9. North orientation arrow



## 2. BUILDING CHARACTERISTICS

- a. **Gross Floor Area:** \_\_\_\_\_ Gross Sq.Ft. x Ceiling Height \_\_\_\_\_ Ft. = volume \_\_\_\_\_ Cu.Ft.
- b. **Conditioned Floor Area:** \_\_\_\_\_ (if different than gross floor area)
- c. **Total door Area:** \_\_\_\_\_ Sq.Ft. Glass doors \_\_\_\_\_ sq.ft. Wood doors \_\_\_\_\_ sq.ft. Metal doors \_\_\_\_\_ sq.ft. Garage doors \_\_\_\_\_ sq.ft.
- d. **Total Exterior Glass Area:** \_\_\_\_\_ sq.ft. Single Panes \_\_\_\_\_ sq.ft. Double panes \_\_\_\_\_ sq.ft.

	North	South	East	West
Total Area _____ sqft	_____ sqft	_____ sqft	_____ sqft	_____ sqft
Single Pane _____ sqft	_____ sqft	_____ sqft	_____ sqft	_____ sqft
Double Pane _____ sqft	_____ sqft	_____ sqft	_____ sqft	_____ sqft

- e. **Total Exterior Wall Area:** \_\_\_\_\_ sqft Material:  Masonry  Wood  Concrete  Stucco  Other

- f. **Total Roof Area:** \_\_\_\_\_ sqft Condition:  Good  Fair  Poor

- g. **Insulation Type:** \_\_\_\_\_ Roof \_\_\_\_\_ Wall \_\_\_\_\_ Floor

- h. **Insulation Thickness:** \_\_\_\_\_ Roof \_\_\_\_\_ Wall \_\_\_\_\_ Floor

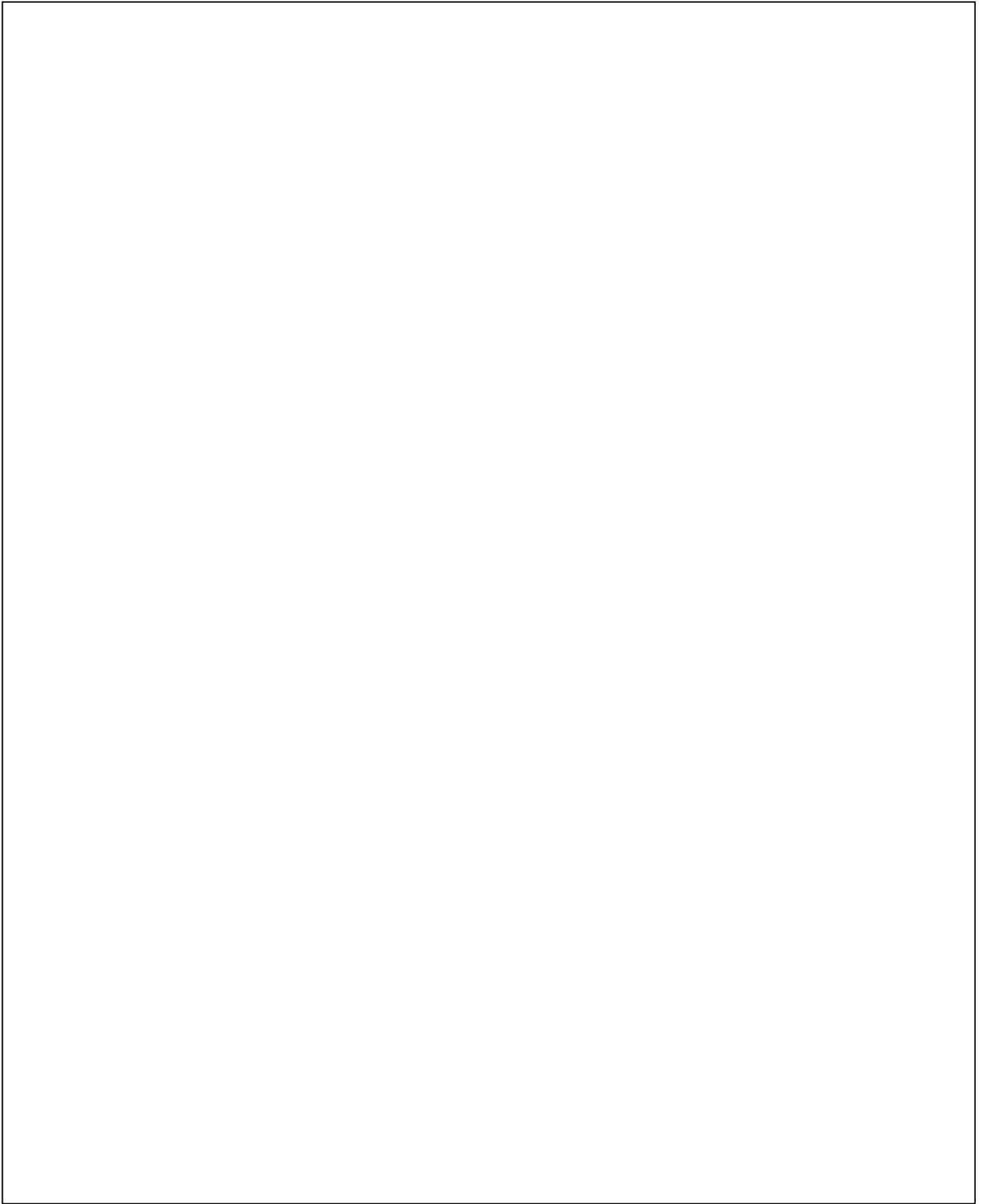
- i. **Metering:** Is this building individually metered for electricity?  Yes  No

Is this building individually metered for natural gas?  Yes  No

Is this building on a control boiler system with other buildings?  Yes  No

- j. **Describe general building condition:**

## SITE SKETCH



Indicate compass direction with a north arrow.

**2. ANNUAL ELECTRIC USE AND COST**

Include Electrical Demand, if applicable

Building		Address					Year of Record From        /        To		
Account Number		Meter Number			Utility				
Maximum kW Demand W/O charge				Minimum Power Factor W/O charge				Building size (sqft)	
1	2	3	4	5	6	7	8	9	10
Meter Read Date From	Date To	KWh* Used	KWh/gross sq.ft. **	Annual (EUI) BTU/sqft (000)	Energy Cost	KW-KVA Demand	Fixed Service Cost	P.F. * and Demand Cost***	Total Cost
<b>TOTAL</b>									

Comments:

Conversion: 3413 BTU/kWh

\*KW – Kilowatts, KVA – Kilo-Volt-ampere, KWH – Kilowatt hour, P.F. – Power Factor

\*\*Total annual kWh divided by the building’s gross sq. ft.

\*\*\*If demand and/or power factor are metered and billed, energy cost here.

### 3. ANNUAL NON-ELECTRIC ENERGY USE AND COST

Photo copy this form for additional fuel types

Building		Address			Year of Record From                      To	
Account Number		Meter Number		Utility		
Building Size (sq ft)		Fuel Type		Specify Units		
Billing Period From                      To		Fuel consumption	Conversion Factor	MMBTU	Annual (EUI) Btu/sq.ft.	Cost \$
<b>TOTAL</b>						

<b>*Conversion Factors</b>	
Natural Gas	100,000 Btu/therm
Natural Gas	1,030 Btu/cubic feet
Liquified Petroleum (LP bottled gas)	95475 Btu/gallon
Kerosene	134,000 Btu/gallon
Distillate Fuel Oil	138,690 Btu/gallon
Residual Fuel Oil	149,690 Btu/gallon
Coal	24.5 million Btu per Standard short ton
Wood	8,680 Btu/pound
Steam	970 Btu/pound
Other	Consult standard Engineering Reference Manual

Comments:



#### 4. HEATING PLANT

	PRIMARY	SECONDARY1	SECONDARY2
(A) System Type Code	_____	_____	_____
How many each type?	_____	_____	_____
Rated Input Consumption	_____	_____	_____
Rated Output Capacity	_____	_____	_____
(B) Energy Source Code	_____	_____	_____
(C) Maintenance Code	_____	_____	_____
(D) Control Code	_____	_____	_____

- | (A) System Type Code             | (B) Energy Source   | © Maintenance Code | (D) Control Code      |
|----------------------------------|---------------------|--------------------|-----------------------|
| 1. Fire tube-Steam               | 1. Natural Gas      | 1. Good            | 1. Manual             |
| 2. Water tube-steam              | 2. LP Gas           | 2. Average         | 2. Somewhat automated |
| 3. Fire tube-hot water           | 3. #2 Fuel Oil      | 3. Fair            | 3. Highly automated   |
| 4. Water tube-hot water          | 4. #4 Fuel Oil      | 4. Poor            |                       |
|                                  | 5. #6 Fuel Oil      |                    |                       |
| 5. Electric Resistance           | 6. Electricity      |                    |                       |
| 6. Heat pump with aux. Elec.heat | 7. Coal             |                    |                       |
| 7. Purchased steam               | 8. Wood             |                    |                       |
| 8. Other (explain)               | 9. Solar            |                    |                       |
|                                  | 10. Purchased Steam |                    |                       |

Operation Profile:

\_\_\_\_\_ hrs/weekday    \_\_\_\_\_ hrs/Sat.    \_\_\_\_\_ hrs/Sun.    \_\_\_\_\_ wks/yr

Estimated annual hours of operation \_\_\_\_\_

From (month) \_\_\_\_\_ through (month) \_\_\_\_\_

Thermostat set points:

Day: \_\_\_\_\_

Night/weekends: \_\_\_\_\_

Heating Degree Days: \_\_\_\_\_ (see table on page 15)

Comments:

## 5. HVAC DISTRIBUTION SYSTEM

Area Served (sq.ft.)	Location of Unit(s)
----------------------	---------------------

	PRIMARY	SECONDARY1	SECONDARY2
A. System Type Code	_____	_____	_____
B. Maintenance Code	_____	_____	_____
C. Control Code	_____	_____	_____

**(A) System Type Code**

1. Single Zone
2. Multi Zone
3. Dual duct
4. Variable air volume
5. Single duct reheat
6. 2-pipe water
7. 4-pipe water
8. Window unit
9. Unit ventilator
10. Fan Coil
11. Unit heater
12. Other (define)

**(B) Maintenance Code**

1. Good
2. Average
3. Fair
4. Poor

**(C) Control Code**

1. Space thermostat
2. Outside temperature sensors
3. Time clocks
4. Energy management system
5. Auto supply temp reset
6. Economy cycle
7. Heat recovery
8. Other (define)

## 6. COOLING PLANT (continued on next page)

Is building mechanically cooled?     Yes         No

(A) System Type Code \_\_\_\_\_ (B) Energy Source Code \_\_\_\_\_ (C) Maintenance Code \_\_\_\_\_  
 D. Control Code \_\_\_\_\_ (E) Voltage Code \_\_\_\_\_

- | (A) System type code                 | (B) Energy source code | (C) Maintenance Code | (D) Control Code      | (E) Voltage Code        |
|--------------------------------------|------------------------|----------------------|-----------------------|-------------------------|
| 1. Reciprocating chiller             | 1. Electric Motor      | 1. Good              | 1. Manual             | 1. 120/single phase     |
| 2. Centrifugal chiller               | 2. Combustion engine   | 2. Average           | 2. Somewhat Automated | 2. 208-220/single phase |
| 3. Absorption chiller                | 3. Steam turbine       | 3. Fair              | 3. Highly Automated   | 3. 208-220/3-phase      |
| 4. Solar assisted-absorption chiller | 4. Steam boiler        | 4. Poor              |                       | 4. 440-480/3-phase      |
| 5. Evaporative chiller               | 5. Purchased steam     |                      |                       |                         |
| 6. Heat pulmp                        |                        |                      |                       |                         |
| 7. DX system                         |                        |                      |                       |                         |
| 8. Screw compressor                  |                        |                      |                       |                         |
| 9. Window or thru-wall unit          |                        |                      |                       |                         |
| 10. Other (define)                   |                        |                      |                       |                         |

## 6. COOLING PLANT (continued)

Operation Profile:

\_\_\_\_\_ hrs/weekday \_\_\_\_\_ hrs/Sat \_\_\_\_\_ hrs/Sun \_\_\_\_\_ wks/yr

Estimated Annual hours of Operation \_\_\_\_\_

From (month) \_\_\_\_\_ through (month) \_\_\_\_\_

Cooling Degree days \_\_\_\_\_ (see table on page 15)

Comments:

## 7. DOMESTIC HOT WATER

Domestic Hot Water Heated by:

Electricity  Natural Gas  Oil  Steam  Heat pump  Other, specify \_\_\_\_\_

Number of Units	General Location(s) of Unit(s)	Is there a re-circulation loop?
Daily Usage (if known) _____ gal/day	Hot Water Temp. At point of Use _____ At heater _____	
Temp. of city water	Is tank wrapped? <input type="checkbox"/> Y <input type="checkbox"/> N	Do obstructions prevent wrapping? <input type="checkbox"/> Y <input type="checkbox"/> N
Distance form Heater to Point of use _____ Nearest _____ Farthest	Hot Water Uses for Other than Laveratories	

## 8. FOOD PREPARATION AND STORAGE AREA EQUIPMENT

Item	Exists		Total load(if known) KW	Item	Exists		Total load (if known) KW
Ranges	Yes	No	_____	Ovens	Yes	No	_____
Steam Tables	Yes	No	_____	Frying Tables	Yes	No	_____
Freezers	Yes	No	_____	Refrigerators	Yes	No	_____
Walk-in Refer	Yes	No	_____	Walk-in Freezer	Yes	No	_____
Infra-red warmer	Yes	No	_____	Dishwashers	Yes	No	_____
Microwaves	Yes	No	_____	Hoods w/Exhaust fans	Yes	No	_____
Mixers	Yes	No	_____	Other, Define _____	Yes	No	_____

## 9. LIGHTING

Building Area*	Type Code of fixture	Approximate number of fixtures	Average watts per fixture	Operating hours/day	Average footcandles**
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

### Lighting Type Codes

- A. Incandescent
- B. Fluorescent
- C. Mercury Vapor
- D. High Pressure Sodium
- E. Low Pressure Sodium
- F. Metal Halide

\*Include indoor and outdoor areas.

\*\* Optional

Comments : (e.g., specially installed energy saving fixtures, bulbs, controls such as wall switchers, timeclocks, dimmers, etc. )

## 10. SOLAR AND RENEWABLE RESOURCE POTENTIAL

Location <input type="checkbox"/> Urban <input type="checkbox"/> Suburban <input type="checkbox"/> Rural														
Building Characteristics # of Stories _____ General shape* _____ <input type="checkbox"/> Roof Unshaded <input type="checkbox"/> Southern Wall Unshaded														
Roof                      Indicate orientation on pg. 6** <input type="checkbox"/> Flat <input type="checkbox"/> Pitched				Roof's primary structural material**					Type of Roofing**					
Composition of Southern Facing Wall							Southern Facing Wall Glass Area <input type="checkbox"/> Less than 25% <input type="checkbox"/> 25-75% <input type="checkbox"/> Over 75%							
<b>Mean Insolation (Btus/sq.ft.) ***</b>							<b>Mean Wind Speed (miles/hr)***</b>							
Jan _____			Jul _____			Jan _____			Jul _____					
Feb _____			Aug _____			Feb _____			Aug _____					
Mar _____			Sep _____			Mar _____			Sep _____					
Apr _____			Oct _____			Apr _____			Oct _____					
May _____			Nov _____			May _____			Nov _____					
Jun _____			Dec _____			Jun _____			Dec _____					
Does the building have adjoining open space along the southern wall? <input type="checkbox"/> Yes <input type="checkbox"/> No														
<b>Monthly Mean Daily Insolation on A Horizontal Surface (Btu/ft2)</b>												Remarks****		
<b>City</b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov			Dec
Seattle														
Tacoma	277	513	978	1487	1856	1886	2089	1668	1196	694	384			236
Spokane	439	753	1185	1749	2078	2199	2454	2052	1491	830	483			277
<b>Monthly Mean Wind Speed (miles/hr)</b>														
<b>City</b>	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Seattle	8	8	9	8	8	8	7	7	7	7	7	8		
Spokane	8	9	9	9	8	8	8	8	8	8	8	8		
Olympia	7	7	8	7	6	6	6	6	5	6	6	8		
Source: Climatic Atlas of the United States														
<p>*Note building characteristics, indicating shape as square, rectangular, E-shaped, H-shaped, L-shaped.</p> <p>**Note roof design. For the orientation of a pitched roof, indicate the compass direction of a line perpendicular to the ridgeline in the direction of the down slope. Note presence of roof obstructions such as chimneys, space conditioning equipment, water towers, mechanical rooms and stairwells. Identify the principal structural material of the roof, e.g., steel concrete, or wood structural components. Also identify the type of roofing such as shingle, slate, or built-up.</p> <p>***Using information from the National Weather Service, the WSU Energy Program, or from charts provided above, enter monthly mean wind speeds and monthly mean daily insolation on a horizontal surface.</p> <p>****Note any special conditions or characteristics related to potential for solar or other renewable resource application.</p>														





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